John P. Update

10/24/19

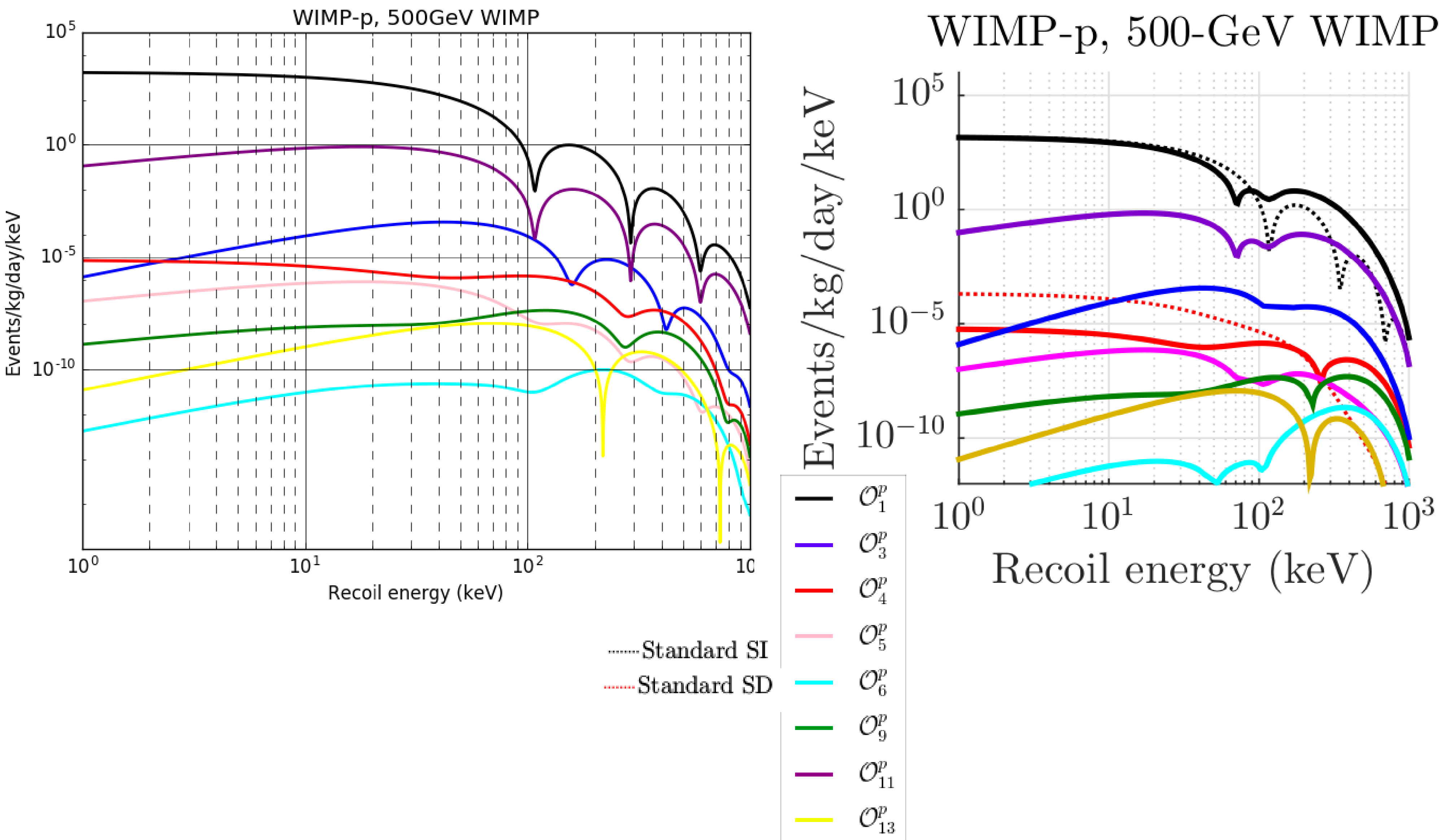
Current State of Things

- The discrepancy between my results and Nicole’s has not been resolved.
- Currently working with Michael to double check the results I’ve gotten so far.
- Still producing “heat map” plots similar to those shown over the summer.
- Starting to consider how the results up to now could be applied to experiments.
- Considering the best way to display my results.

Differential spectra for various operators. WIMP-proton scattering, 500GeV WIMP.

My specs

Nicole's specs



The Discrepancy with Nicole:

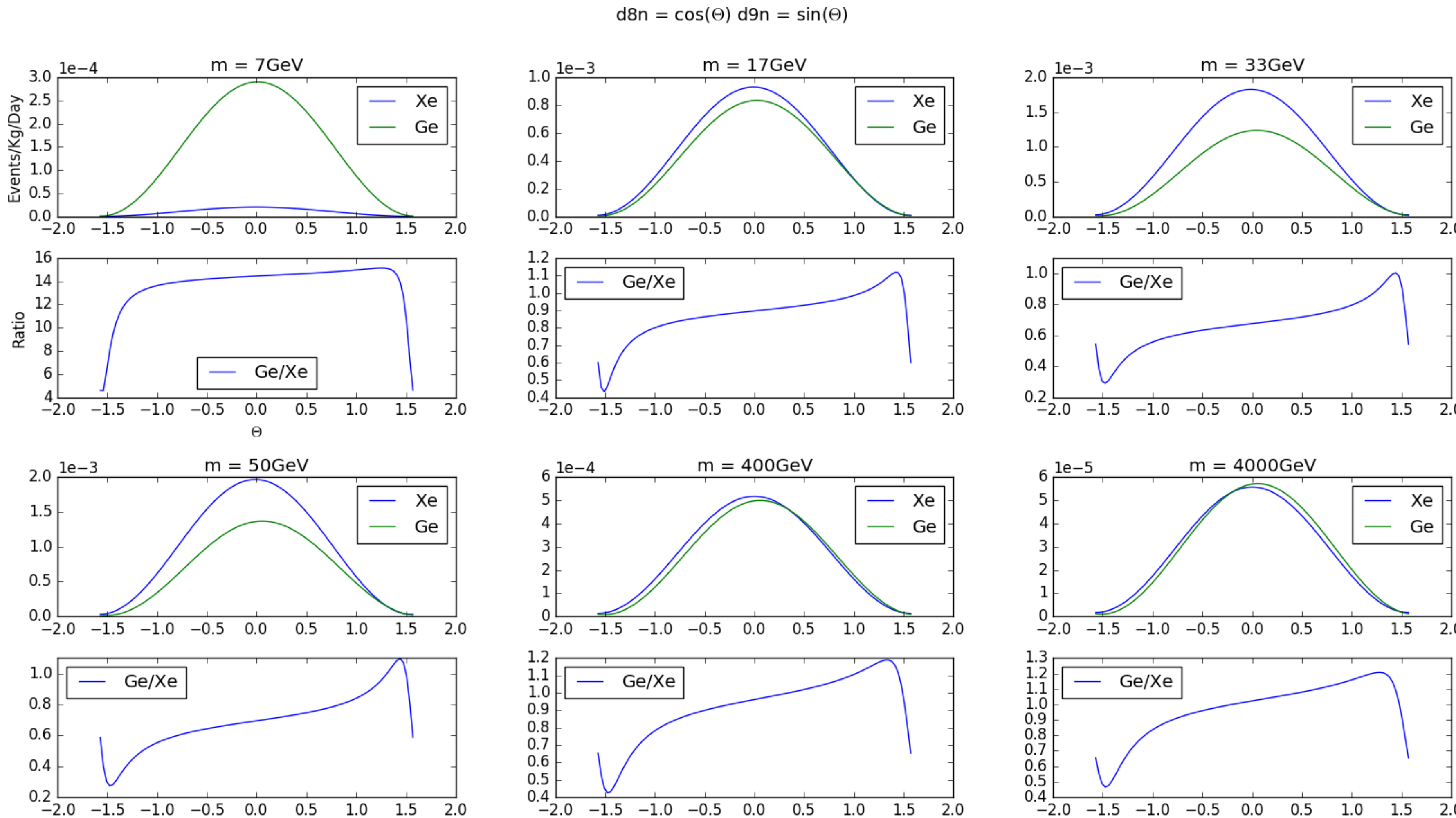
- Over the summer, I found that my interferences and differential event rate spectra disagreed with those reported by Nicole.
- Looked over the matlab code used by Nicole and couldn’t see any errors (missing velocity integrals and nuclear FF defs).
- I was also told that Nicole used an old version (5) of the Mathematica package. I recalculated some differential spectra using this version and saw no difference from my other results.

Heat Map Plots

- Made some adjustments to how results are displayed.
- Also made an adjustment to take detector efficiencies into account.
- Started comparing individual isotopes.

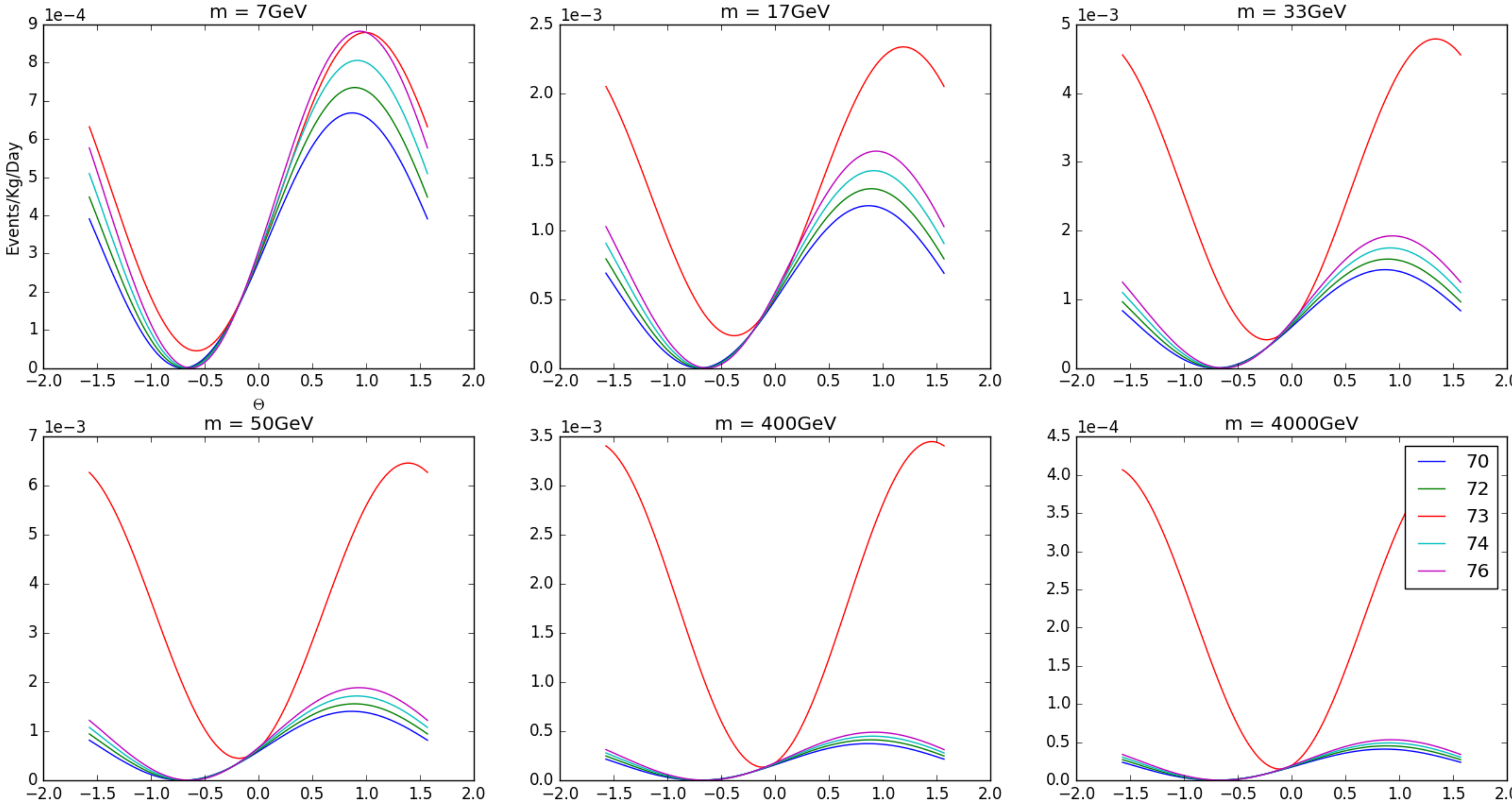
$$\mathcal{O}_8 = \vec{S}_\chi \cdot \vec{v}^\perp$$

$$\mathcal{O}_9 = i\vec{S}_\chi \cdot (\vec{S}_N \times \vec{q})$$



$$\mathcal{O}_8 = \vec{S}_\chi \cdot \vec{v}^\perp$$

d8p = cos(Θ) d8n = sin(Θ)



Heat maps for operator 8 isospin interference. Each curve is for a different germanium isotope.

$$
\begin{aligned}
\mathcal{O}_1 &= 1 \\
\mathcal{O}_2 &= (v^{\perp})^2 \\
\mathcal{O}_3 &= i\vec{S}_N \cdot (\vec{q} \times \vec{v}^{\perp}) \\
\mathcal{O}_4 &= \vec{S}_\chi \cdot \vec{S}_N \\
\mathcal{O}_5 &= i\vec{S}_\chi \cdot (\vec{q} \times \vec{v}^{\perp}) \\
\mathcal{O}_6 &= (\vec{S}_\chi \cdot \vec{q})(\vec{S}_N \cdot \vec{q}) \\
\mathcal{O}_7 &= \vec{S}_N \cdot \vec{v}^{\perp} \\
\mathcal{O}_8 &= \vec{S}_\chi \cdot \vec{v}^{\perp} \\
\mathcal{O}_9 &= i\vec{S}_\chi \cdot (\vec{S}_N \times \vec{q}) \\
\mathcal{O}_{10} &= i\vec{S}_N \cdot \vec{q} \\
\mathcal{O}_{11} &= i\vec{S}_\chi \cdot \vec{q}
\end{aligned}
$$